putting a piece of dried protochloride, sesquichloride, or protosulphate of iron, in a solution of silicate of potash :—

$$3(2Fe_2O_3SiO_2) + 2(KO,CO_2).$$
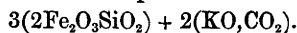
This would, in all probability, be the silicate formed by the mutual decomposition of an alkaline silicate and sulphate, or bicarbonate of iron.

The great facility with which this mineral decomposes and behaves in acids, and its peculiarities generally, would seem to show that the silicates of zinc and iron are in some sort of combination, and not simply intermixed. If from the whole we deduct not merely the oxide of iron, but also the amount of silica and water combined with it, the remainder will contain oxide of zinc, silica, and water, in the proportions represented by the formula $2ZnO,SiO_2,HO$.

Perhaps many other minerals containing peroxide of iron, &c., would present us with a like phenomenon, if we could dissolve one constituent like the silicate of zinc. There are, no doubt, many cases where foreign substances cannot be considered to be merely mechanically mixed in a mineral, and yet cannot be held to replace some constituent isomorphically, which may be explained in this way. Indeed, it is probable, that many of the so-called isomorphic replacements are in reality such compounds, held by a very feeble affinity, but which, unlike the one here in question, cannot be dissected.

The Rev. Samuel Haughton, M.A., F.R.S., Fellow of Trinity College, Dublin, read the following paper :—

On a Graphical Mode of Calculating the Tidal Drift of a Vessel in the Irish Sea or English Channel. (Plate II.)

The change of level in the surface of tidal water, between two given hours, may be graphically calculated by the method given by Mr. Airy in his Treatise on Tides and Waves. Let a circle be described whose radius is *half* the Range of Tide, and painted on a vertical wall; the tide, in its rise and fall, will cover and uncover equal arcs of this circle in equal times. If this circle be divided like the dial of a clock, XII. and VI. corresponding to the top and bottom of the vertical diameter, and tidal hours be used, the rise or fall of the water may be easily calculated.

In calculating the Drift produced by the Tidal Stream, we are not given the total drift in six tidal hours, which would correspond to the Range of the Tide; but we have instead the maximum velocity of the Tidal Current at half-flood and half-ebb.

The following construction will enable us easily to calculate the Tidal Drift between two given hours :—

Let a circle be described whose radius is DOUBLE *the maximum rate of stream, and let this circle be divided into Tidal Hours ; from the two given*

hours let fall perpendiculars on the diameter joining **XII.** *and* **VI.** : *the intercept between the feet of these perpendiculars, measured on the scale of the diameter, is the Tidal Drift required.*

This construction, which is rapidly made in practice, will, I believe, be found of great value to masters of vessels entering or clearing the Irish Sea and English Channel. It may be thus proved:—

Let v denote the velocity of the Tidal Stream.

,, a ,, maximum velocity of the same.

,, t ,, time measured in Tidal Hours, from XII. o'clock, on the tidal dial.

,, $n = \dfrac{2\pi}{T}$,

,, T = twelve tidal hours $(12^\mathrm{h}\ 24^\mathrm{m} = 744^\mathrm{m})$.

Then

$$v = a \sin nt, \tag{1}$$

therefore

$$ds = a \sin nt\, dt,$$

$$s = -\frac{a}{n} \cos nt + \text{const.},$$

$$0 = -\frac{a}{n} + \text{const.};$$

and, finally,

$$s = \frac{a}{n} (1 - \cos nt). \tag{2}$$

This is the Tidal Drift, measured from the commencement of the Ebb. It is evidently proportional to the versed sine of the Tidal Hour; and therefore the construction is proved, provided we can show that the radius of the Tidal Clock is *double* the maximum rate of the stream.

Calling H the Tidal Hour, we have

$$s = \frac{a}{n} (1 - \cos H),$$

$$= \frac{12^\mathrm{h}\cdot 4a}{2\pi} (1 - \cos H),$$

$$= 1\cdot973a\, (1 - \cos H);$$

and, taking this between any two Tidal Hours, we have

$$s - s' = \text{Tidal Drift} = 1\cdot973a\, (\cos H' - \cos H). \tag{3}$$

For practical purposes, 1·973 is so nearly equal to 2, that the circle whose radius is *double* the maximum velocity a, will answer for the graphical calculation.

As an example of the use of the construction I have given, let us take the case of the mail-steamer from Kingstown to Holyhead, at 7 P.M. this evening.

This steamer leaves Kingstown at $7^h 25^m$ Greenwich time, and expects to arrive at Holyhead at $11^h 25^m$. The High Water at the Head of the Tide to-night will take place at $6^h 42^m$ Greenwich time. Therefore the Tidal Hours of the steamer's departure and arrival are—

Departure from Kingstown, ... XII·43^m
Arrival at Holyhead, ... IV·43

Taking the maximum rate of stream between Kingstown and Holyhead at 3 knots per hour, and making the construction I have pointed out on the circle of 6 knots radius, we find that the Ebb Tide will drift the steamer 7·8 knots to the southward of Holyhead Harbour, unless a correction be applied in steering. (Mr. Haughton here exhibited a Tidal Card, by means of which the rise or fall, and the tidal drift, could be calculated for any case in a few moments.) (Vide Plate II.)

This is nearly the greatest amount of Tidal Drift that the Kingstown and Holyhead steamers are subject to. Their greatest drift is 8·16 knots, which will occur to the South, when their times of departure and arrival are I. and V. by the Tidal Clock; and 8·16 knots to the North, when their hours of departure and arrival are VII. and XI. by the tide. There is, therefore, in this four hours' run, which is made at the rate of 16 miles per hour, a possibility of the steamer finding herself, if she neglect the Tidal Stream, 9 miles to the north or to the south of Holyhead or Kingstown. In a fog, when the passage is delayed, it has sometimes happened that these steamers have found themselves off Bray or Dalkey Sound, when they supposed they were close to the mouth of Kingstown Harbour. The Tidal Stream in the Irish Sea is greatly modified by the wind, which, if northerly, will cause the Ebb Tide to carry out more water than its proper share past the Tuskar entrance; and, *vice versâ*, the wind, if southerly, will aid the Ebb Tide through the North Channel, and seriously embarrass vessels beating to the southward.

This complication of the tides caused by the wind has not yet received the amount of attention its importance merits; and it is well expressed in the following statement, which I have received from Mr. J. Bowling, Master, R. N., in command of H. M. tender, "Badger," whose long experience in the Channel entitles his opinion to much weight :—

"H. M. Ship Badger, June 12th, 1861.

" It has occurred to me that there was a point of some importance in direct connexion with the subject of the tides, namely, the great difference which must exist between the strength of the succeeding flood and ebb-tides, with strong prevailing winds up or down channel.

" Take, for instance, from the Saltee Islands to Holyhead, within which bounds it is a well-known fact, that the tides rise much higher, and continue to flow much longer with strong winds up channel, than

under ordinary circumstances; the result is, that the agent that forces the South-coming tide up checks that from the North, in the same proportion, both as to rise and duration. The equilibrium being destroyed, the stronger current from the South overruns its natural bounds (between Morecambe Bay and Carlingford), whereby a large proportion of the water which enters by the South escapes by the North Channel, giving additional velocity to the succeeding ebb thereof, and reducing the force of the South in a corresponding ratio.

"Continuing to speak of the South Channel, which is the great highway to and from Liverpool, and the other large commercial ports in the St. George's Channel, let us imagine a vessel between Holyhead and the Irish Banks being caught in thick weather, with strong winds up-channel; let us suppose her to be for two or three days (as is often the case) without being able to ascertain her position; a fair wind springs up; the master, after making due allowance for all things to the best of his judgment, shapes a course to clear the Tuskar; but I am sorry to say that they, in too many cases, find themselves on shore, or escaping by a miracle from Arklow, Blackwater, or some of the other numerous banks above the Tuskar.

"I have been for the last twenty-six or twenty-seven years, from time to time, cruising in the Irish and English Channels, and have had ample opportunity, in all kinds of weather, of studying the effects of the tidal currents, and my experience has led me to believe the above to be correct.

"I have, particularly for the last nearly six years that I have been on this station, made it my business to question masters of vessels (and particularly those who had the misfortune to get on shore), upon the point above set forth, but have never met one who appeared to bestow a thought on the possibility of the water escaping by any other than the channel by which it entered; but all have admitted the force and justice of my argument, and most were ready to attribute their misfortune to some such unforeseen circumstance.

"I may add, that it is a well-known fact, that all vessels brought up by the banks imagined themselves to have been much further to the southward than where they had found themselves.

"These remarks are equally applicable to the English Channel, as well as to winds from the opposite direction.

<div align="right">

"J. BOWLING,

"*Second Master in command.*"

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The Secretary of the Academy having announced the presentation of the remainder of the documents belonging to the Antiquarian Department of the Ordnance Survey of Ireland, it was

RESOLVED,—That the Academy gratefully acknowledge the receipt of 35 MS. volumes of the Irish Ordnance Survey collection, supplemental to the 103 volumes presented on the 30th November, 1860, by authority of the Right Hon. the Secretary of State for War; and hereby present their special thanks to Sir Henry James, R.E., Superintendent of the

Ordnance Survey, and to Captain Wilkinson, for this further most va-
luable donation; again expressing their sense of the importance of the
services rendered to the History and Antiquities of Ireland by Major-
General Sir Thomas A. Larcom, under whose superintendence the plan
of collecting materials for the illustration of our ancient Topography was
organized, and successfully carried into effect.

The Librarian having announced a donation by the Master of the
Rolls of England of the Series of Calendars of the State Papers and of
Historical Publications lately issued under his direction, it was

RESOLVED,—That the thanks of the Academy are due, and are hereby
returned, to the Right Hon. the Master of the Rolls of England, for his
very valuable and acceptable grant to our Library of the Series of Calen-
dars of the State Paper collection, and the Series of Historical Publica-
tions issued under his Honor's superintendence.

The Academy then adjourned.

STATED GENERAL MEETING.—SATURDAY, NOVEMBER 30, 1861.

THE VERY REV. CHARLES GRAVES, D. D., President, in the Chair.

The President having inquired whether there was any business to
be transacted, the Secretary reported that there was no matter for the
formal consideration of the Academy.

The Rev. DR. REEVES read the following Memoir of Stephen
White :—

FATHER JOHN COLGAN had been for several years labouring in the com-
pilation of his great work on the ancient worthies of Ireland, and had two-
thirds of his task done, when the letter, with the carriage of which, for the
hearing of the Academy, I have been honoured, was written to him by his
venerable and respected countryman, Stephen White. Among the many
distinguished Irishmen whose spirits were stirred up within them at the
wholesale attempt made by Dempster and his Scotch contemporaries to
affix the historical label SCOTIA, without even a duplicate, to their por-
tion of Britain, and transfer to its annals all the celebrity of ancient Ire-
land, almost the earliest,* and certainly the most accomplished, was the
writer of this letter. He it was who opened that rich mine of Irish
literature on the Continent, which has ever since yielded such valuable
returns, and still continues unexhausted; and by his disinterested ex-
ertions, less enterprising labourers at, or nearer, home, not only were made

* In Messingham's Florilegium, published in 1624, we find the name of *Stephanus
Vitus* as a reference upon the true application of the name Scotia. Tractat. Præambu-
laris (last page but two). Opposite White's account of the Reichenau MS. of St. Colum-
ba's Life, in the Ussher MS. is written in Ussher's hand the date 1621, 31 Maii. See
the Irish Archæol. and Celtic Society's edition of Adamnan's Columba, Preface, p.
xxxviii. From the following letter we learn that he commenced his pursuits in Irish
antiquities about the year 1611.